

mixture of sand, and even with yellow chalk-lime, furnishing still a water-cement of good quality at a cost materially lower. In such aquatic operations as are executed by tide-work, that is, at low-water only, it is often used alone; but in dry situations, one part of cement and two of sand are common; and in stuccoing, even one to three may be sufficient; but how much sand may be added necessarily depends on the quality of the cement, and it is a general rule that the best which hardens with the largest proportion of sand: such as will not take from 1½ to 2, and retain a strong cohesive power, cannot be considered good. This part of the subject is very important to observe, not only in an economical point of view, but in reference to the increased facility in working which is obtained by the addition of sand; for as by itself it sets rapidly, and only a small quantity may on that account be prepared for use at one time, the workman has the less difficulty to contend with in floating an extent of surface, in proportion as it is combined with more sand. It is not at all elastic, and therefore when worked it should not be disturbed; nor ought it to be applied where there is any liability to warp or change in any way. Contradictory statements are made relative to its admitting of being laid on in more than one coat, some averring that if hatched over like the pricking-up coat of common plaster-work, another and another being added, will perfectly combine together; but its decided rejection of wet seems an overpowering argument against this supposition, seeing that the inward evaporation from the coat last applied not being absorbed by the previous one, must necessarily form a separating medium: thus, a second coat may be considered as little better than hung upon the first by means of the keys formed by the hatching; and the conclusion is, that its adhesion can in no case be complete to any surface which is of a nature similarly unfavourable to a previous coat of itself.

39. Preparatory to stuccoing, brickwork should be cleaned and damped over, the latter to prevent its too much absorbing the moisture, and giving it thereby a porousness of structure unfavourable to the perfect exclusion of wet; also to facilitate its adhesion. It is said that if the sand happen to be moist previous to mixing, the cement must be used immediately. With the genuine cement, in consequence of its setting so quickly, a skilful workman alone can produce good work; and the hand-float requires to be used with great care.

40. The **Lias Limes** are obtained from a dark-blue or dove-coloured stone, of an earthy or slaty structure, very abundant at Barrow-on-Soar, in Leicestershire; Watchet and Bath, Somersetshire; Lyme Regis, Dorsetshire; and Atherthaw, Glamorganshire. Those of Lyme Regis and Atherthaw are used in London; the latter is somewhat the better in quality and burning: by exposure to the weather they assume outwardly a liver-brownish hue; when burnt, they are buff. They are extensively employed for outside stuccoing, and are the only kind of stone-lime much used for that purpose, for which they are by some esteemed superior to the Roman cement, being less liable to blister and crack; and from their resemblance to building-stone when finished, not requiring to be coloured. The proportions commonly used in stuccoing are three parts coarse sharp sand to one part lime for a first coat, and two of fine sand to one of lime for finishing: the lime should be carefully screened. Lias lime being considerable dearer than the Dorking grey chalk lime, partly owing to the greater quantity of fuel and longer time required in its burning, is not much employed about towns in forming water-cement; the chalk lime aforesaid generally answering that purpose sufficiently well, although not quite so strong: it is argilliferous in its nature. The proportion of clay in those of Watchet, Bath, and Atherthaw, is, according to one authority, about 11½ per cent.; in that of Barrow, the average of three analyses gave about 14½; that is, 4½ths nearly, but as high as 4½ths has been stated. These limes are said to continue a long time good if kept in close casks; and especially if slaked to powder and closely packed: they are superior to all the five calcareous stones mentioned in article 11. The Athenæum Club-house, Charing-cross Hospital, and the

Blind Asylum in St. George's Fields, were built with Lias stone-lime.

41. The hydraulic limes obtained in the vicinity of Strasburg are said to form cement of excellent quality.

42. Water-cements may be formed artificially by calcining together the different ingredients which compose natural substances of known hydraulic character; therefore, where these cannot be procured naturally, there can seldom be much difficulty in obtaining satisfactory substitutes, even superior in quality to the others, according as they are regulated with more or less precision in the relative proportions of their essential components, and with the omission of such as are not necessary: 53 per cent. by weight of carbonate of lime, 18 of protoxide of iron, and 29 of silica and alumina in equal parts, have been stated as affording the desired result; about 30 per cent. of slaked lime, mixed with the other two ingredients after their calcination, serving if deemed more expedient, instead of the quantity of carbonate above mentioned. Bergman, a Swedish chemist, who is considered to have been the first to give an analysis of a hydraulic limestone, found that of Lena, in Sweden, to contain 90 per cent. of lime, 4 of clay, and 6 of oxide of manganese; and he was of opinion that the latter gave the hydraulic character to the lime, and was necessary in all water-cements. Gayton de Morveau, a French chemist, was the first to make an artificial hydraulic lime; and he composed it by calcining together pulverized lime, clay, and black oxide of manganese, in proportions corresponding with the Lena limestone, agreeably to Bergman's analysis. He also attributed to the manganese the merit of affording the aquatic property. This, indeed, was in accordance with the opinion that at one time prevailed; but which, however, gave way to the one permanently established, that it is clay which is essential, and that manganese is indifferent, although a little of the latter, added to mortar, makes it harder under water; as is also the case with iron. The hydraulic limestones or marls of Senonches and St. Catherine's, near Rouen, on being analyzed, were found to contain 68 per cent. of carbonate of lime, 12 of alumina, 6 of sand, 2 of oxide of iron, and 12 of water.

43. But it is not only by the method above indicated that water-cements can be factitiously obtained; for many of excellent quality are formed by mixing with common mortar a selection from a large variety of non-calcareous substances, very diversified in their nature yet affording to the mortar the property of indurating under water: wood and coal-ashes and cinders, coal-dust, tile and brick-dust, pounded tiles and clinkers, burnt clay, pounded pottery, forge-scales, roasted iron-ore, pomice-stone, basalt, powdered quick-lime; and others, of which there will be occasion to treat, are put in requisition for this purpose.

(To be continued.)

#### IMPROVEMENTS IN THE METROPOLIS

**Kensington.**—Her Majesty's Commissioners of Woods and Forests have decided upon the plan to be carried into effect for the formation of a new avenue, to be called the Queen's-road, extending from the Usbridge road to High-street, Kensington, being the site of the late Royal Kitchen-gardens. Twenty-one detached villas, here already been commenced upon either side, and each of these will be surrounded by nearly an acre of garden ground. Various designs for the villas, gates, and lodges, have been submitted to the Commissioners, and those of Messrs. Wyatt and Brandon, Mr. Owen Jones, and Mr. Kendall have been decided upon. In the plans selected, all of which are in the Italian mode, are designs for mansions to be built of stone, and some of them contain upwards of 40 rooms, and in most are apartments on suite upwards of 100 feet in length. The greater portion of these structures are already secured by aristocratic and wealthy families; and Mr. Blashfield, the lessee under the Crown, has undertaken to have them finished during the coming summer. The villas upon the east side command a view of Kensington-gardens. The road will be upwards of a mile in length, and 70 feet wide, and will connect

the two great western roads. The government, police, lighting, sewerage, and indeed the entire management, is to be under the control of the Commissioners of Woods and Forests, who are about to build two lodge entrances, and to select and pay liveried gate-keeper and other subordinates, to render the undertaking as complete as possible.

**St. Giles-in-the-Fields.**—The locality called the Rookery, which is situate on the line of the new street that is to connect Oxford-street and Holborn, near Southampton-street, and which for many years has been the resort of the abandoned of both sexes, is about to be removed for the improvements in this neighbourhood. Sixty houses, forming Buckridge-street on the north, and Church-street on the west, have been sold by private contract (it not being thought advisable to dispose of them by auction, in consequence of their low value), and several men are now employed in their removal. The purchaser of the property, which belonged to Colonel Buckridge, has great difficulty in getting rid of the inmates, and in some of the houses, though the roofs have been taken off, they still remain. The occupants of the different premises to be cleared away have received notice from the Commissioners of Woods and Forests to quit; so that in a short time a wide area of ground will be open for the erection of the new buildings, including the large stone-yard in George-street, which belonged to the parish of St. Giles-in-the-Fields, which was sold a few days ago, and the station-house of the E division, in the room of which the Commissioners of the Metropolitan Police have purchased three houses in Clerk's-buildings, Broad-street, St. Giles's, behind which cells are being erected.

**TRAFALGAR-SQUARE.**—Several men have been this week engaged in sculpturing the basement of the Nelson pillar; and there appears to be little doubt but that orders have been given to complete this national memorial as speedily as possible. The small portion of the promenade laid down in cement was scarcely completed on the day of admission of the public, and was consequently not set. Much of it is therefore broken, the portion being that placed between the bitumen, some of which is also broken away. Sticks, stones, umbrellas, and in some cases, hammers have been employed by the public to test the solidity of the works,—all these attempts would probably have been successfully resisted had full time been allowed for the cement and bitumen properly to harden. The damage done will have to be repaired by the laying down of blocks of the like material sufficiently hardened at the manufactory of the patentee without allowing it to be subjected to the "practical experimentalism" of the public. It is said to be in contemplation to remove the turrets from the top of the National Gallery, and it is further said to be the intention of the commissioners to order the preparation of another statue to be placed on the north-west pedestal in the square, instead of removing that of George III., as previously contemplated.

**EVON COLLEGE.**—It has been notified to the authorities of the college that his Royal Highness Prince Albert will lay the foundation-stone of the extensive new buildings which are to be erected forthwith, at an expense of 26,000*l.*, immediately contiguous to the ancient edifice, in that portion of the premises known as Weston's yard. The precise period for the laying of the foundation-stone is not yet determined upon. It is expected, however, to take place about the middle of next month.

The statue of the late Duke of Gordon has been placed on its pedestal, in Castle-street, Aberdeen. The statue is by Campbell, and is 11 feet 3 inches in height; including the base and pedestal, the height, in all, is 21 feet 6 inches.

**WOOD PAVING.**—As an instance of despatch with which wood-paving may be laid down, the Metropolitan Company received orders, late on the evening of last Saturday week, to pave 2700 yards at the Bricklayers' Arms terminus, which they completed on Tuesday night.

Above two thousand pictures, many of them of singular merit, have been rejected at the Royal Academy, owing to want of space.